entomologists, that the honey bee uses its mandibles, at least on some occasions, as weapons of attack, quite as much as the sting; this would also corroborate the exactness of Mr. Thompson's observations. —A. S. PACKARD, JR., *in Am. Naturalist.*

BURSTING OF THE FRUIT OF EUPHORBIA COROLLATA.—Mr. E. E. White, of Lincoln, Iowa, has noticed the bursting of the pods of *Euphorbia corollata*, with a report loud enough to be heard across an ordinary room. An entire plant had been brought into the house with the view of saving the seed and the reports soon took place. This note is given not so much with the idea that this bursting is peculiar to *Euphorbia*, but that it may call out similar observations and thus group them together in a tangible shape.—PROF. WM. C. WHITE.

CHARACÆ. – For the benefit of several subscribers who have expressed a desire to know something of the structure and position of *characæ*, we take from B. D. Halsted's paper upon the "Classification and Description of the American Species of Characeæ" the following description:

The members of this distinct group of Cryptogams are all filamentous, submerged, aquatic plants, to the naked eye either green or ashy gray in color, depending upon the presence or absence of a calcareous incrustation. The plants are attached by a long, colorless, root-like structure to the muddy bottom of the pond or stream in which they grow, and often form dense masses varying according to the species from a few inches or two to three feet in height. They are remarkable for their large thin-walled cells and the cyclosis of their contents.

In number there is something over a hundred species.

*Development:*—At the upper end of the spore there is first produced by division a thin-walled, hemispherical shaped cell. This cell soon divides into two by a cell-wall parallel to the longer axis of the spore. Both of these new cells increase in size and push themselves out between the separating ends of the fine enveloping spirals, one turning downward to become the primary rhizoid, the other upward to form the proembryo. The proembryo, the upper portion of which is green, consists of but a few alternating nodal and internodal cells. When the Chara plant develops, one of the disc-shaped nodal cells divides up first into two, and afterwards, by successive divisions, into a number of cells, the largest one of which becomes the initial cell, or *punctum vegetationis* of the future plant. From this cell by further growth and repeated cell divisions the Chara plant is developed.

*Antheridia* (*globules*):—These, the male organs, are situated on the leaves and are often of an orange color, and from .50 to .75 mm. in diameter. The wall consists of eight cells called shields, closely joined by their serrate edges. The four basal ones are somewhat four sided; the upper four triangular. From the center of each shield-cell there projects into the interior of the antheridium an oblong cell called the manubrium. Each manubrium is surmounted by

a smaller cell known as a capitulum. The capitula end in turn in six secondary capitula from each of which grow four long flagelliform threads which are composed of small disc-shaped cells. The antherozoids are borne singly in the cells. When free from the cell the antherozoid is a spirally twisted, naked, protoplasmic body, many times longer than broad, and is capable of a very rapid motion by means of two cilia which are placed near one end.

*Sporangia* (*nucules*) :—These are the female organs and when mature are usually of an ovoid shape, and .30 to 1.10 mm. in length. The sporangium consists of a large central cell, the spore and five tubes which are coiled closely around it. The sporangium is a transformed leaflet.

*Non-sexual organs of reproduction* :—Bulblets are found in a number of species; they occur most frequently at the lower nodes of the plant near the surface of the ground, where few or no leaves are developed and the internodes are colorless.

A second method of non-sexual reproduction is found in *Chara fragilis*, which is called by Pringsheim "Branches with naked base."

*Classification* :—It is difficult to place the Characeæ very close to any other group of Cryptogams. Their method of development, sexual organs, and anatomical structure separate them from the Vascular Cryptogams on the one side, and the Thallophytes on the other; and bring them nearer to the Muscineæ than to any other general group. Of the Muscineæ they bear the most resemblance to mosses. Differing as they do widely, even from the mosses, in being less complex in structure and in the development of the fruit, it seems fitting that the Characeæ be placed in a group by themselves and arranged with the others in the following order, proceeding from the highest to the lowest : *Vascular Cryptogams*, *Muscineæ*, *Characeæ*, and *Thallophytes*.

SAPORTA'S WORLD OF PLANTS.—In the Popular Science Monthly for February is a review of Count de Saporta's work translated from *Revue Scientifique* by Miss E. A. Youmans. The general bearing of the work is well shown by the reviewer's preface. "Men of science, whose patient researches have accumulated the proofs of the theory of evolution, have perhaps found more facts in support of this great philosophical doctrine in the vegetable than in the animal world. When we say the vegetable world, we of course mean chiefly fossil vegetables. It is only by the study of extinct forms, and their comparison with the living flora, that the affinities between actual types and distant ancestors have been discovered. and their mode of evolution revealed. Vegetable paleontology, it is true, is yet in its infancy, and has many great gaps; still, the rapidity with which it is being developed, and the prodigious number of facts that have been already collected, give good ground for the hope that the day is not far distant when we shall have surely determined the ancestral lines of most of our plants. To this the efforts of paleontologists are tending, and their activity is beyond all praise. During the last twenty years their discoveries have furnished the matter for large volumes and for many memoirs, pub-

lished in the reports of academies of science, in the bulletins of geological societies, etc. But the profound lessons derived from these discoveries have hitherto been almost the exclusive possession of scientific men. People of general intelligence, who are interested in all progress, have known little of the results obtained. This injustice could be no longer tolerated. A complete treatise was required, written in a style that all could comprehend, and summing up the progress thus far accomplished; and M. de Saporta, one of the most eminent authorities in vegetable paleontology, has just published such a work."

"The study of fossil flora not only enables us to follow the evolution of plants from their remotest known ancestors to their present actual descendants, but it throws much light upon the past mysteries of the earth, and especially upon the climatic conditions which controlled its surface while the slow revolutions of organic life were going on." We will quote here and there from the review, not having space for the entire article, although one of great interest to all interested in the history of plants. "There exists between a flora and the climate in which it lives a relation so close that, knowing the one, we can represent the other. Palms do not grow in Greenland nor fir-trees on the plains of equatorial Africa. Each climate has its flora, and each flora its climate.

Paleontology has established the permanence and universality of this law; but it has at the same time established a singular fact which remains inexplicable. It is this: the different climates of the earth have not always been what they are now, either as to temperature or distribution. We speak only of those epochs which have succeeded each other since the time of the most ancient known plants. If we transport ourselves in thought to a time toward the end of the Tertiary period, and then, leaving behind us the Quaternary epoch, follow the course of ages, we find, as an increasing enlargement of the tropical zone, that which is equivalent to an increase of temperature for the whole earth. More extended in the Pliocene epoch than in our day, this zone was still greater in the Miocene epoch, and yet greater in the Eocene, and so on till we reach a time when it embraced the whole surface of the earth, bestowing everywhere an equal temperature, feebly oscillating between certain limits. This climatic equality, which, according to Saporta, reaches at least as far back as the time of the coal, would probably cease at the epoch of the lower chalk. Such is the fact established by examination of the flora of different ages."

"Saporta divides the world of fossil vegetables into four great periods: 1. The Primordial or *eophytic*, corresponding to the Laurentian, Cambrian, and Silurian; 2. The Carboniferous or *paleophytic*, comprehending the Devonian, Carboniferous, and Permian; 3. The secondary period or *mesophytic*, commencing with the Trias and reaching to the end of the chloritic chalk; 4. Finally, the Tertiary or *neophytic*, embracing all the formation from the chalk of Rouen up to and including the Pliocene."

"The flora of the eophytic period is unknown. The *debris* which represents it has in general a character so vague that there is yet no agreement upon its true nature. The graphite found in the Lauren-

tian indicates, however, that from this epoch vegetables existed in great abundance."

"Many of these primordial plants are undeniably linked with more modern types, of which they bear the generic form, and prove that this primordial flora is not really separated from that which followed it. We can even affirm that certain Silurian algæ have had a duration so prodigious and a tenacity of character so pronounced that their last direct descendants were living in the European seas in the middle of Tertiary time."

"With the Devonian things changed. The bad state of preservation of fossil vegetables belonging to this formation has not permitted us to study them perfectly; but, from the aspect of those which we possess, we conclude that at this epoch the vegetable kingdom was already vigorous and varied, and that nature while in its infancy put forth the carboniferous flora, the almost inconceivable exuberance of which has never since been equalled." "The plants of this flora belong exclusively to the two classes of vascular cryptogams and gymnospermous phanerogams." "The Permian flora, which succeeded the Carboniferous, is only a pale reflection of it." "Saporta says of the Trias, which commences the Secondary or mesophytic period, that "it appears to correspond to one of those periods of revival where the failing types finally disappear, while those which displace them are successfully introduced. The first leave chasms because they are reduced to a decreasing number of individuals; the last are yet obscure and rare. Both old and young are equally feeble, and, when these two extremes meet, the apparel of nature seems poor and monotonous." At the beginning of the Jurassic period a transformation is already manifest, and we soon find ourselves in the presence of a new flora, where the carboniferous types have disappeared, but where, except some rare monocotyledons, the angiosperms are still wanting. From Spitzbergen to Hindostan, from Europe to Siberia, everywhere the same vegetable forms, so that the character of the Jurassic flora is monotonous, lifeless, and relatively indigent." "We know not under the influence of what conditions organic evolution, and especially the appearance of dicotyledons, has taken place; but we do know that from the commencement of the neophytic period, these plants appear in a multitude of places and multiply with great rapidity." "This revolution," says Saporta, "has been as rapid in its progress as universal in its effects."

NOTES ON FUNGI.—In printing Miss Banning's paper in the January GAZETTE some mistakes were made which should be corrected. In the description of *R. emetica* (p. 7) read "rose-color" instead of "sage-color." *R. alutacea* (p. 7) has "buff-colored" spores instead of "half-colored." In *A. rubescens* (p. 6) from Eastern Maryland the spores measure .0003 x.00032 inch; small plant from Western Maryland .0003 x.00026 inch.

CATALPA SPECIOSA, WARDER.—On page 3 of the January GAZETTE "3½-4 times" should read "3½-4 lines." The date of Dr. Warder's

first publication of this species, in the Western Horticultural Review, is 1853. The dissepiment (p. 3, l. 22,) of *C. bignonioides* is flatter (or more compressed) but not "flat" as is stated.

CORRECTION.—On page 12 in the last GAZETTE, for "coniferous" read "cruciferous."

When in some emergency an editor weakly yields to the temptation of doing some careless "stuffing" he is very apt to repent it at his leisure. Fortunate is he if his patrons are both keen enough and friendly enough promptly to call his attention to the fact and thus prevent a repetition of the offence. The note reprinted from the *Independent* in the last GAZETTE has called forth such an inundation of rebukes and remonstrances as to completely counteract any tendency to "stuff" in the future. We wish to print a part of one of the best of these, from a botanist of high rank, both for our own satisfaction and the benefit of our patrons:

"The *Polypodium vulgare* is certainly not our form of the species, and is very probably not *P. vulgare* at all. But in the story about *Pringlea* the mistakes are very amusing. The statement is:—"One of these (*Pringlea antiscorbutica*) is not only special to the Island, but it is distinct from any known coniferous plant in having powdery pollen and no petals."

*All* coniferous plants have "powdery pollen and no petals." *Pringlea* is not special to the Island, but occurs on three other groups or islands. It is not *coniferous*, but is *cruciferous*. (This mistake was not the fault of the writer in the *Independent*.—ED.) It has petals sometimes, "1–4, clawed, rosy-tipped, inconspicuous, caducous."

It differs from the crucifers not in having powdery pollen, for all crucifers have powdery pollen, but in that the pollen is produced in greater abundance, and in that the grains are "smaller, and perfectly spherical, instead of ellipsoid with three furrows."

Sir Joseph Hooker thinks the plant is anemophilous, while the rest of the order is said to be entomophilous. *Pringlea* though closely related to *Cochlearia*, has more the habit (and the use) of a cabbage, and as it grows on islands where winged insects are either scarce or wanting, it is not strange that it should be wind-fertilized."

THE BOTANICAL INDEX.—This neat quarterly, published by L. B. Case, Richmond, Ind., still continues to be full of interest, especially to the horticulturist. The press-work and designs are fine, and in the last number a brief summary of botanical progress for the past year, evidently prepared with great labor, is of interest to every botanist.